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NEW YORK, SATURDAY, AUGUST 3, 1895.

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(Illustrated articles are marked with an asterisk.)

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For the Week Ending August 3, 1895.

Price 10 cents. For sale by all newsdealers.

THE PHYSICS OF THE BICYCLE.

When a wheelman is moving forward on a bicycle, what keeps him up? That is the question asked by inquisitive minds, as the rider passes swiftly along on a wheel base practically without width. Sitting on a still wheel is an almost impracticable feat; but it is simple enough to maintain an upright position when moving at a very slow speed. It is a physical fact that a body in motion persists in maintaining its plane of motion, and unless some additional force acts on the body at an angle to the original line of motion, it will continue to move in its original plane until stopped by friction or arrested by an obstruction. A body set in motion tends to move in a straight line, and will do so unless affected by a force acting on it in a different direction from that of the first movement.

To illustrate this point we might refer to the rim of a flywheel, which moves in a certain plane, but not in a straight line, because it is confined to a circular path by its spokes. Should the flywheel burst, its parts would fly off in paths that would be perfectly straight but for the force of gravity, and it is only too well known that these pieces are not easily deflected from the paths taken by them at the moment of the explosion.

A wheelman is propelled through space at a velocity sufficient to cause him to maintain his plane of movement. Should he desire to change this plane of motion, as in describing a curve, he can do it only by calling in the aid of gravity, i. e., he must lean to the concave side of the circle, more or less, according to the radius of the curve he is following. And further, in describing a curve, he is impelled outwardly by centrifugal force, which is more or less, according to his velocity, and he must oppose this force by a centripetal force, which in this case is gravity. This he does also by inclining his body toward the center of curvature of the path he is describing. In this case the wheel sometimes forms a considerable angle with the ground, so that under some conditions it slips from under the rider. It is in view of this fact that the circular bicycle race track at Manhattan Beach, Coney Island, has lately been constructed with a considerable downward inclination toward the center, so that wheels spinning on this curved track would be more nearly at right angles with the surface on which they roll.

The ability of a bicycle and rider in rapid motion to do serious damage in a collision with another machine or with a pedestrian is fully appreciated by few wheelmen. A man weighing 150 pounds and moving at the rate of ten feet per second (which is only about seven miles per hour) has a momentum of 1,500 pounds, leaving out of the account the weight of the wheel. This is sufficient to upset any pedestrian with terrific force. It has been suggested that the pneumatic tire forms a sort of fender which would prevent serious concussion in case of a collision. It would undoubtedly have a slight modifying effect, but it would be of little account. A collision between two wheels, each with a 150 pound rider, spinning at the moderate speed of seven miles per hour, would result in a smashup with a force of 3,000 pounds. In view of these facts, it is no wonder that bicycle accidents are often very serious.

The tractive force required to propel a bicycle over a smooth level surface is estimated at 0·01 of the load; calling the load 150 pounds, a force of 1½ pounds would be required to move the wheel forward, and this calls for a pressure on the pedals of 6¾ pounds on a wheel geared in the usual manner. When, however, the road is rough or on an up grade, the case is different. On a grade of 1 in 10, for example, the rider, in addition to the tractive force, actually lifts $\frac{1}{10}$ of his weight and that of the machine.

With a rigid or semi-rigid tire the rider is obliged to exert sufficient force to lift himself over every obstruction encountered by the wheel; the descent from the obstruction gives back a portion of the power expended in surmounting it, but not all of it. In the case of the pneumatic tire, however, the small obstructions are not an opposing element of any consequence, as the tire yields, in lieu of the wheel being raised, and the result is the wheel travels as upon a smooth track.

NEW PRIZES FOR MOTOR CARRIAGE COMPETITIONS.

In the belief that the invention and perfection of the vehicle motor is destined to work a revolution in road transportation, and with a view of stimulating invention along that line, the proprietors of two papers, one in America and the other in England, have offered substantial cash prizes to be given to the winners in two new races. In America the Chicago Times-Herald offers $5,000 to be awarded in a race between Milwaukee and Chicago; and in England the Engineer offers one thousand guineas ($5,000) to the winners in a race to be held in some place in England, which will be decided upon later. The Times-Herald contest will take place about the 1st of November and definite details as to the exact date of the contest, with such regulations concerning it as may be decided upon, will be soon announced. The first prize will be $2,000 and a gold medal, the same being open to the competition of the world; second prize $1,500, with a stipulation that in the event of the first prize being awarded to a vehicle of foreign invention or manufacture this prize shall go to the most successful American competitor; third prize, $1,000; fourth prize, $500. The third and fourth prizes are open to all competitors, both foreign and American.

Over twenty-one American inventors have already notified the Times-Herald of their intention of competing. The present indications are that there will be not less than fifty and possibly double that number of vehicles entered in this race. It is too early to state how many French and German manufacturers will enter the lists, but it is probable some of the prize winners in the recent Paris Bordeaux contest will endeavor to gain additional prizes. It is likely that the Daimler motor, which has proved so successful in both of the competitions held in France, will be used on several of the carriages. The offer of the Times-Herald is made with no intention of starting a "horseless carriage fad" or of promoting a craze in this direction, but it is the opinion of the best mechanical experts that the inventive genius of the world is in a fair way to solve the problem of propulsion on common roads by mechanical means, if it is not already solved. America is a country of magnificent distances, and its resources can never be utilized to the greatest advantage until the mechanical genius of the country has brought transportation to its highest possible development.

For some time past the Engineer, of London, has urged the repeal of such provisions of the existing acts of Parliament as prevent the use of light vehicles propelled by steam or other power on the public roads of the United Kingdom. On July 20, Mr. Shaw-Lefevre introduced the bill in the House of Commons designed to facilitate the introduction of horseless carriages in England, and when he explained the matter, not a single member objected, which was the more remarkable, considering how hard it usually is to overcome British conservatism.

The Engineer believes that the introduction of the automobile carriage into England would throw open a new branch of trade, so that the start which Continental engineers have made may not be allowed to interfere unduly with the home industries of Great Britain. They have, therefore, offered the sum of 1,000 guineas in two or more prizes for public competition upon one of the main roads of the kingdom. The rules and details of the competition and the names of the gentlemen who have consented to act as judges will be given out at an early date, and will be duly announced in these columns.

The carriages driven by petroleum now cost a cent or one and one-half cents an hour per horse power to drive them, so that even for a long journey the cost for fuel is not very great. The first cost of an automobile carriage is about $1,000, not much more than a good carriage. Hardly any one would care to run a machine carriage more than ten hours a day, the cost being 50 cents a day for fuel or $15 per month. Under favorable circumstances a good horse cannot be kept in a large city like New York or Chicago for less than about $30 to $35 per month. Because motor vehicles for common roads are practicable in France and England, it does not necessarily follow that they would be in America. The roads in those countries are almost perfection; but in this country a fairly good road is the exception, i. e., roads that are good the year round. Between the mud of the rainy season and the roughness when this mud is frozen, there are long periods of time when the petroleum carriage would have great difficulty in transporting passengers or freight.

ATLANTA EXPOSITION NOTES.

The work of construction at the Cotton States and International Exposition is rapidly approaching completion. Several of the buildings have been finished and accepted by the Exposition managers. The work of installation in the Electrical building has already begun, and the Machinery building is ready for exhibitors. The parking is almost finished and the grounds and buildings are beginning to resemble the completed Fair. The water from the city water works has been turned into the lake.

Dr. Daniel C. Gilman, president of Johns Hopkins University, has accepted the position of chief of the Department of Awards at the Exposition. This should be a guarantee of the high merit upon which the awards will be based.

The General Council of Philadelphia has decided to send the Liberty Bell to Atlanta. The request was refused at first, but the permission was granted after the Legislature of Pennsylvania decided to make a State exhibit.

The electric fountain at the Exposition is being constructed under the direction of the designer, Mr. Luther Stieringer. The design is that of a twin fountain, rising from an island in the center of the grand basin, immediately in front of the Machinery Hall.

The island which forms the groundwork for the base

of the fountain covers the operating chamber, which is 100 feet long and 50 feet wide. There are 19 orifices, each with 7 to 10 jets; the electric lights used under each orifice to project the beam of light through the water are of 250,000 candle power each. The forms of water used are the solid stream, the geyser, the spray and the fog bank. The highest jets will rise something over 100 feet from the basin of the lake. The fog bank is to be produced by steam condensed by means of spray. The four forms will be used alternately in various ways with fine effect. The streams and geysers will be interspersed with circular pipes throwing jets in the form of wheat sheaves.

A party of newspaper men and ladies have arranged a house boat party to leave New York on the 1st of September for the Exposition. The route which they will take is a good illustration of the facilities for water travel through the United States. The route as outlined will traverse the Hudson River from New York to Albany, thence by the Erie Canal to Buffalo, thence to Cleveland, along the shore of Lake Erie, then to Portsmouth, Ohio, by the Ohio Canal, where the Ohio River will be taken to the Mississippi, and the latter down to some convenient point, probably Memphis, from which the railroad will be taken to Atlanta.

LEATHER CANNON.

On another page we give illustrations and an account of the recent trial by the United States Ordnance Board of Latulip's rawhide cannon, which, at first glance, might seem to be a decided novelty. But it is a curious fact that leather cannons were among the earliest powder weapons used. Rawhide, however, has advantages over leather for this purpose. The following is from Farrow's Military Encyclopædia:

"A variety of cannon introduced by Gustavus Adolphus into the army, on account of their mobility. Undeniable evidence, however, of their earlier existence, though of a smaller size, is found in the Landeshuter Harnisch-Kammer-Inventarium, of 1562, in which mention is made of a "Lange lederne Buchse mit Kugel-Modell." Although Gustavus Adolphus improved and perfected the leather cannon which he introduced into his army in 1626, and which he used in the siege of Wormditt, yet neither he nor the German Freiherr Melchior von Wurmbrandt, nor the North British Baron Robert Scot, can be regarded as the inventor. The invention is evidently of much earlier date. A leather mortar for firing shells, on exhibition in the arsenal at Venice, was, the Venetians assert, made in 1349; it is very likely, however, that its origin is somewhat earlier. One is here reminded of the many substitutes for metal ordnance, especially of the wooden cannon entirely bounded with iron hoops, which are frequently mentioned in the period from 1525 to 1530.

The leather cannon varied from a 1-pounder to a 4-pounder. The bore consisted of a copper cylinder, of the thickness of three fourths of the diameter of the ball used. The length of the cylinder was 16 calibers. Cascable and breech were screwed into the cylinder. The vent of copper was screwed into the breech. The entire length of the bore was covered with iron hoops, over which a number of ropes were wound, which in turn were covered with several layers of varnish. Over these layers another round of ropes was wound, and over this was spread a layer of cement. This process was repeated until the coat was of the thickness of two calibers. The last coating consisted of tarred leather, which gave the cannon its name. The charge amounted to one-fourth, rarely one-third of the weight of the ball; the cannon was loaded only with canister.

Canister shot, until that time only used in sieges, was introduced by Gustavus Adolphus into the field service and consisted mostly of musket bullets, though old pieces of iron were very often used. The shot were put into wooden and tin boxes, linen bags, and sometimes only in rude wicker baskets. The leather cannon of ninety pounds weight, with its light carriage, was easily drawn by two men. This cannon, however, by no means met the high expectations entertained of it. Already in 1631 the Swedes ceased using this nature of gun, because at the battle of Brietenfeld it not only became so overheated that the charges ignited of themselves, but it also gave a very short and unreliable range. In 1629, a certain Lieutenant Wolf Muller, of Chemnitz, circulated the report that he was in possession of a secret for the construction of leather cannon which had many and decided advantages over metal ordnance. The Elector of Saxony ordered Col. Von Schwalbach to investigate and to report as to its worth. The report of the colonel was found to be favorable, and expressed in these words: "Owing to their light weight, easy transportation, and saving of powder, as well as the advantages they offer in the field against the enemy and in mountainous and swampy regions, in which latter places heavy cannon can seldom be used at all, such pieces cannot be too highly regarded," etc.

The Elector ordered the construction of two leather cannon, for which were given "fifty-seven florins three groschen, ready money, seventeen florins three groschen for sixty pounds pewter; fifty-one florins three groschen for two and one-fourth hundredweight refined copper. Of the copper, the coppersmith received two hundredweight, with which he made a tube four and one-half ells long, weighing ninety pounds, and used twelve pounds for muzzle and vent. The waste in melting twice amounted to sixteen pounds, the remainder was left to the smith as pay for his work."

The trial with these leather guns could not have been very satisfactory, if we may judge from the following item of a record of weights of the armory at Dresden, June 14, 1630:

"Inventory of the weights of copper and pewter of the burst leather pieces in the Elector's Armory at Dresden: Copper, one-half hundredweight twenty-six pounds; pewter, thirty-four pounds." No mention being made of these guns at a later period, it is taken for granted that this one failure was thought sufficient to cool all enthusiasm for leather cannon."

THE HEAVENS IN AUGUST.

The chief celestial event for August is the attainment by Venus of her greatest brilliance on the night of the 13th, or more strictly speaking, the morning of the 14th; yet this can hardly be called an event, either, since it is a part of a continuous phenomenon, Venus having gained gradually in light ever since she became an evening star, early in the year. And although from the 14th she will begin to lose light, yet the loss will not become conspicuous until near the end of the month. Now is the time for all possessors of good telescopes and good eyes to study Venus; for the possibility exists of making an important discovery concerning that planet. Some weeks ago the cable brought from Europe the news that a curious notch had been detected at the Vienna observatory near the south horn of Venus and observers in this country were advised to look for the phenomenon, and note its peculiarities. The meaning of this is that Venus, which now appears in the form of a crescent moon, has on the inner, or concave, edge of the crescent, near the southern end, a narrow scallop as if a bit of the face of the planet had been cut out there. The phenomenon is not a new one. It has been seen many times before, and, reasoning on the basis of what plainly appears on the moon in similar circumstances, it would seem that this notch in Venus may be caused by the shadow of a gigantic mountain mass in the Antarctic region of the planet. The importance of a careful study of this and other faint markings on Venus depends not merely upon the information it may give concerning the surface features of that interesting globe, but also upon the bearing it may have on the question of the rotation period of Venus.

Schiaparelli has asserted that the rotation of Venus is very slow and that probably it turns but once on its axis while making a revolution around the sun. It is easy to see that, if such is the case, Venus possesses no alternation of day and night, such as we enjoy on the earth, but that, on the contrary, it is always day on one side of the planet and always night on the other side. And the orbit of Venus departs so slightly from a circle, and her axis is apparently so nearly perpendicular to the plane of the orbit, that there can be very little libration, in either latitude or longitude, to affect the presentation of the planet's surface toward the sun.

Now it must be confessed that, without drawing freely upon the imagination, it is not easy to reconcile such a state of things as that just described with the conditions which would seem to be necessary in order to render a planet habitable by beings resembling ourselves. Of course, perpetual sunshine might not prove destructive to highly organized living forms, for they could, in various ways, be shielded from the effects of such a superabundance of radiant energy, and, on the other hand, life might exist where the only radiation received came from the stars. But, as I have remarked in a preceding article, Venus is so much like the earth in several other respects, that one would prefer not to believe she is so much unlike it in this, unless the evidence of the peculiarity ascribed to her by the Italian astronomer can be shown to be irrefragable. It is very much to be desired, therefore, that the present opportunity shall be fully utilized to add as greatly as possible to our knowledge of the markings and the motions of Venus.

At the beginning of the month Venus is in the southern portion of Leo, and before the end she will have passed into Virgo. Everybody, of course, knows where to look for her—in the west after sundown; and nobody will have to look twice to find her, but anybody who can see her once and not look again is fitter to be despised than that imaginary creature of Shakespeare, "who hath no music in himself."

Next to Venus, Saturn is the most conspicuous planet now on view, and I repeat my advice to everybody who can get the opportunity to take a good look at its marvelous rings. One might travel to the confines of the universe without finding anywhere an exact duplicate of them. To see them with an adequate telescope is to become on the instant an astronomer, if spirit if not in practice.

Saturn remains some ten degrees east of Spica, the bright star of Virgo. By the end of the month it will set too early to be advantageously studied with a telescope.

Mercury, Mars and Neptune are too near the sun for observation. Jupiter begins to emerge from the sunlight as a morning star early in the month, but will not be well seen before the autumn months. Uranus remains in Libra a few degrees east of the star Alpha.

The moon fulls on the morning of August 5 in the constellation Capricornus, and reaches last quarter near noon on the 13th in Aries. Beginning its circuit again as new moon on the morning of the 20th in Leo, it attains first quarter on the 27th, about a quarter before 1 A. M., in Scorpio. It is in perigee on the 20th and in apogee on the 7th. A partial eclipse of the sun occurs on the morning of the 20th, but will not be visible in this country.

It will be observed that the moon is in perigee, or nearest to the earth, on the day of the eclipse, when, of course, it will be just in a line from the earth to the sun. Under such circumstances not only is the moon's tidal attraction greatest, but its attraction is at the same time united with that of the sun. The consequence must be higher tides than usual; while those who believe that the varying strain of the sun's and the moon's tidal pull on the earth is an element in the production of earthquakes should expect unusual phenomena of that kind about the time of the eclipse.

The moon will be seen near Venus on the evening of the 22d, near Saturn on the evening of the 24th and near Uranus on the evening of the 25th.

GARRETT P. SERVISS.

Cycle Notes.

The greatest achievement of the bicycle of late was the covering of 515 miles within twenty-four hours, which was done by a Frenchman named Huret. It is well known that but few horses have been able to go 100 miles in this time. But it is not the exceptional speed or endurance of phenomenal riders which makes the bicycle the most popular invention of this or any other time. There is a charm, a degree of freedom, a power, belonging to the bicycle which only those who ride it comprehend.

Amos Holmes, of Unadilla, N. Y., 94 years of age, claims to be the oldest bicycle rider in New York State.

One of our correspondents, who is now taking a cycle tour through France, reports that the French and English wheels are heavier and more clumsy than the American vehicles. A first-class wheel, such as Americans use, is not to be had in Europe. Our correspondent regrets he did not take his Yankee wheel with him.

Bike Don'ts.—A writer in the New York Sun gives the following:

Don't be down on everbody else's wheel except your own.

Don't go back and apologize when you knock a man or woman off their pins. You may mean well, but you will find the person knocked down unreasonable and sometimes impertinent.

Don't ride over railway crossings. Don't try to instruct others unless you know a good deal about riding yourself. Don't laugh at beginners, but remember that we've all been there ourselves, and don't get dissatisfied with your own wheel because some one has a machine that is a little better.

Don't lend your wheel unless you do it to get rid of the borrower, and you may feel pretty sure that you get rid of your wheel at the same time, for it always injures a bicycle to lend it.

Don't allow your wheel to remain in a dirty condition for even a very short time.

DECISIONS RELATING TO PATENTS.

United States Circuit Court of Appeals — Seventh Circuit.

RUSSELL VS. KERN.

Letters Patent Nos. 133,898, 137.495, 154,770 and 158,992, to George T. Smith, for middlings purifiers, having expired prior to the commencement of the suit, afford no basis for equitable relief.

Letters Patent No. 164,050, granted June 1, 1875, to George T. Smith, for middlings purifier, having expired after the filing of the original bill, but before the return day of the subpœna, it was within the discretion of the court to dismiss the bill for want of equity.

Letters Patent No. 187.923, granted February 27, 1877; No. 194,539, August 28. 1877; No. 208,936, October 15, 1878; No. 236,101, December 28, 1880, and No. 258,142, May 16, 1882, to George T. Smith, for middlings purifiers, Held invalid as being for indivisible inventions covered by earlier patents to the same party.

Appeal from the Circuit Court of the United States for the Eastern District of Wisconsin.

Before Woods, Jenkins, and Showalter, judges.

Woods, C. J., delivered the opinion of the court.

Bill dismissed.